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The Tenure Game: Building Up Academic Habits

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Abstract: Why do some academics continue to be productive after receiving tenure? This paper answers this question by using a Stackelberg differential game between departments and scholars. We show that departments can set tenure rules and standards as incentives for scholars to accumulate academic habits. As a result, academic habits have a lasting positive impact in scholar's productivity, leading to higher scholar's productivity rate of growth and higher productivity level.

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1. Introduction

The arguments in favor of academic tenure have focused mainly on academic freedom, cost effectiveness and pedagogical quality [McGee and Block, 2001]¹. The academic freedom argument states that professors need tenure to avoid losing their jobs for defending controversial subjects or espousing unpopular views. Tenure is claimed to be cost-effective because people are assumed to be risk-averse and the perspective of getting a job for life make them willing to work for less than people who cannot receive a guarantee of lifetime employment². In addition, tenure solves the moral hazard problem of selecting new faculty members. If universities do not have full information to identify the best candidates to hire, while incumbent professors do, the incumbents need tenure in order to make them reveal who the good candidates are without fear of losing their job to accommodate the candidate [Carmichael, 1988]³. Last but not least, the argument regarding pedagogical quality reflects the idea that only those professors who achieve excellence in teaching, research and service are awarded tenure.

These arguments have been heavily criticized. If tenure is really necessary to protect freedom of expression, what about the untenured professors that go up for tenure and espouse views contrary to the tenured academics that decide their promotion? They may have their tenure denied because they disagree with the committee's view and as a

¹ For a review of the tenure literature and recent controversies see McPherson and Shapiro (1999).

² As a promotion system academic tenure can be associated to tournaments [e.g., Lazear and Rosen, 1981] since scholars during the probationary period accept below-market wages for above-market effort because of the prospect of being rewarded in the future by higher pay and greater job security.

³ McPherson and Winston (1983) note that academic employment has little internal job mobility. Candidates who are hired as faculty members either stay on the faculty or are dismissed. Because of the lack of flexibility the university has to adopt more intensive and costly initial screening.

consequence the freedom of expression argument loses value⁴. For instance, it has been shown that champions of diversity are more interested in imposing "politically correct" thoughts and speech on organizations than heralding divergent opinions and experiences [Goode, 1991a, b; Scott, 1991; Timmons, 1990; Will, 1991].

Concerning the cost effectiveness of tenure, Alchian (1977) argues that tenure is neither necessary nor efficient. Moreover, its survival depends upon the absence of a competitive environment in the education industry. Colleges and Universities can afford incompetent and/or unnecessary tenured professors because the full costs of the tenure system are not imposed on them. They are shielded from competition through government regulations and accreditation agencies, and they are sometimes heavily subsidized by alumni, corporations and governments.

The pedagogical quality argument is criticized because favoritism and politicking plays an important role in the tenure process [Roche, 1969]. In addition, even in the absence of bias in the tenure process, there are no guarantees that the excellent untenured professor will continue to be excellent after receiving tenure.

This paper addresses this last issue and disputes its validity by arguing that academic excellence can be a permanent trait of anyone who achieves it. That is, an excellent untenured scholar continues to be excellent after receiving tenure if the tenure process creates incentives that make this scholar develop academic habits. Therefore, the creation of academic habits represents another argument in favor of academic tenure.

Academic habits are the working habits a person develops in order to achieve the required standards of academic excellence, which ultimately lead to tenure. These

⁴ For McKenzie (1996) tenure is a means of protecting individual faculty members from political infighting by increasing the costs predatory faculty members must incur to be successful in having more productive colleagues dismissed. For a model of academic sabotage see Faria (1998).

working habits depend on several factors including hard work, dedication, perseverance, collegiality, intellectual honesty, creativity and personality, to cite a few.

In this paper we do not question the existence of the tenure system; we take it as given and put forward a model where tenure rules and standards affect academic habit formation. In the model the academic department sets the tenure rules and standards for tenure-track faculty members that lead to the build up of academic habits. Academic habits have a lasting impact on a scholar's career, shaping its future achievements regarding research, teaching and service. As a result, once a scholar has a stock of academic habits, he will remain productive even after receiving tenure.

When a scholar achieves excellence in teaching and service, it is hard to see them declining. A good teacher generally employs the same successful pedagogical techniques and is often required to teach the same courses year after year, which makes his job easier with seniority. The same holds true for service, once the scholar becomes a good administrator there is no reason to believe that these skills will disappear in the future. However, if a scholar has achieved excellence in research, by no means does it guarantee that he will continue to be successful in the future. This happens because to keep excellence in research the academic must employ time and skills in acquiring new knowledge, techniques and be lucky enough to have his ideas welcomed by his peers in an increasingly competitive environment which is the market for publications in peer review journals.

Therefore, the underlying important question of our study is the following: Why would a tenured professor bother to do research at all? Given the fact that he will not lose his job if he does not publish, why spend time in keeping up with the frontier of

knowledge?⁵ Our answer to this question is simple: because the scholar has a stock of academic habits that have a lasting impact in his future productivity.

Although Levin and Stephan (1991) find that the research productivity of scientists reduces with age, this can be understood as a consequence of a life cycle of academic productivity. Regarding economists, Hamermesh (1998) finds that publications in leading journals decline very sharply with age. However, what matters here is whether tenure affects future research productivity of scholars that acquire academic habits and are considered high achievers. According to Blackburn and Lawrence (1995) and Bess (1998) among those faculty who begin as high publishers “there is virtually no change in productivity rates after tenure” [Bess, 1998, p.12].

This paper presents a Stackelberg differential game between departments and scholars, where the department is the leader and the representative scholar is the follower. It is assumed that the department solved its moral hazard problem through incumbents’ choice of the best candidate for the job, which is the representative tenure-track scholar. In the differential game the department takes into account the effects of its choice of tenure rules and standards on the scholar’s productivity and academic habit formation, while the scholar takes the department choice as given. It is shown that departments can set tenure rules and standards as incentives for scholars to accumulate academic habits. As a result, academic habits have a lasting positive effect in scholar’s productivity, leading to a higher scholar’s productivity rate of growth and productivity level.

The paper is organized as follows. In section 2 the scholar problem is presented, while the department problem appears in section 3. Section 4 presents the steady state

⁵ Samuelson’s answer to this question is that scholars seek fame [Samuelson, 1995]. However, after years being successful publishing, the marginal gain in reputation is arguably low. For a model of a reputation-seeking academic see Faria (2002).

equilibrium of the model. The comparative statics analysis is shown in section 5. Section 6 brings the concluding remarks.

2. The scholar problem

The scholar's preferences over time are represented by the utility integral

$$\int_0^{\infty} U(F_t, H_t) e^{-rt} dt; U_F > 0; U_{FF} \leq 0; U_H < 0; \text{ and } U_{FH} \leq 0 \quad (1)$$

Where $r > 0$ is the scholar's rate of time preference, F is the scholar's academic productivity and H is the scholar's reference academic productivity level, i.e., the stock of academic habits.

The sign of the first derivative of $U(.)$ with respect to F results from the intellectual formation of a tenure-track professor. There is a self-selection process in the human capital formation of an individual that chooses to remain for a number of years in the university aiming at obtaining a Ph.D. degree [which is a pre-requisite for a university career as a professor]. Anecdotal evidence suggests that students that love to study are the ones that choose to remain at the university pursuing a Ph.D. degree. This is why we assume the representative scholar to derive pleasure from his academic work.

Concerning the impact of academic habits, we follow the literature on habit formation in which the stock of habits are assumed to have a negative marginal utility [e.g., Heal and Ryder, 1973]⁶. Regarding the second derivative of U in relation to the stock of habits, it is generally assumed [e.g., Abel, 1990] that $U_{HH} < 0$, while in the

⁶ Dupor and Liu (2003) distinguish between the notion of "jealousy" and "admiration" by looking at the first derivative of the reference benchmark on utility. By assuming a negative first derivative we are considering that preferences exhibit jealousy.

particular branch of rational addiction models in some cases [e.g., Gavrilu et al., 2005] we have $U_{HH} > 0$.

It is important to emphasize that the habit formation framework is particularly useful here because of the learning process implicit in it. For instance, in models of habit formation in consumption it is assumed that people learn to consume by consuming and the more they learn the more they enjoy [Boyer, 1978]. This idea is extended in a series of cases where learning plays an important role. Jellal and Garoupa (2004), for example, develop a model of enforcement learning where the law enforcement agency accumulates data and information on criminals, which decreases agency's costs and enhances its ability to perform its duties. More closely to our problem, however, is the idea put forward by Faria and Leon-Ledesma (2004) in which labor is habit forming⁷ in accordance with society's culture.

In the present context, we assume that the scholar develops his working habits taking into account the average academic productivity level of his peers P [which can be his former professors, actual department colleagues or any other relevant academic group such as the people around the world that do research in his specific field], and his own productivity F , in order to achieve the tenure standards, T , set by the department⁸:

$$\dot{H} = \rho(F^\phi P^{1-\phi} + \Omega - T) \quad (2)$$

the speed of adjustment, ρ , parameterizes the relative importance of recent productivity in determining the reference stock. Therefore, higher values of ρ indicate a lower level of

⁷ See also Dimitrova (2004) and Gurdgiev (2004).

⁸Using Mumford and Smith (2004) terminology expression (2) can be defined in terms of the employee characteristics [measured by (F)] and the workplace effects [measured by (P)]. However, our definition of workplace effects is broader than theirs, because we do not limit our workplace effects to the current place where the scholar works.

persistence in habits. The parameter ϕ lies in the unitary interval. Setting the parameter $\phi=0$ identifies the outward-looking scholar, for whom the academic habits formation depend only on T and P . While by setting $\phi=1$ corresponds to the inward-looking scholar⁹, for whom the reference stock depends on his own past levels of productivity as well as T . Finally, the constant $\Omega > 0$ warrants the non-negativity of \dot{H} since it is assumed that $\Omega \geq T - F^\phi P^{1-\phi}$.

It is important to stress that tenure rules and standards, T , are objective measures of scholar's achievement. For example, regarding research, T is a list of peer reviewed journals with respective weights and indicates a minimum amount of points the tenure-track faculty should obtain in order to be considered for tenure promotion.

The representative scholar problem is to use his productivity, F , as a control variable to maximize (1) subject to (2), which yields the following Hamiltonian function:

$$J = U(F, H) + \lambda \rho(F^\phi P^{1-\phi} + \Omega - T) \quad (3)$$

Where λ denotes the scholar's shadow value of academic habits.

In order to solve the scholar's problem let us assume that: $U(F, H) = aF - \frac{b}{\xi} H^\xi$.

It is convenient to mention that the linearity of the utility function in relation to F is not a problem for our model since the optimality conditions from the Maximum principle require that the Hamiltonian function be maximized with respect to the control variable F at every point of time. It is easy to see that the Hamiltonian function J is concave in

⁹ See Alvarez-Cuadrado et al. (2004) where an outward-looking agent specification captures the characteristics of a catching up with the Joneses model, while the inward-looking agent specification characterizes the habit formation model.

relation to F . Regarding the second derivative of the utility function, U , in relation to H , we must consider two cases: i) if $0 < \xi < 1$, then $U_{HH} > 0$; ii) if $\xi > 1$, then $U_{HH} < 0$.

The first order conditions for the scholar's problem are:

$$J_F = 0 \Rightarrow a + \lambda \phi \rho F^{\phi-1} P^{1-\phi} = 0 \quad (4)$$

$$\dot{\lambda} - r\lambda = -J_H \Rightarrow \dot{\lambda} - r\lambda = bH^{\xi-1} \quad (5)$$

Plus the transversality condition $\lim_{t \rightarrow \infty} e^{-rt} \lambda H = 0$.

From equations (4) and (5) we derive the evolution of scholar's productivity F in time:

$$\dot{F} = \frac{F}{(1-\phi)} \left[r - \frac{\phi \rho b}{a} P^{1-\phi} F^{\phi-1} H^{\xi-1} \right] \quad (6)$$

The examination of equation (6) leads us to the first important result of the paper, which is summarized in proposition 1:

Proposition 1: The growth rate of the scholar's productivity $\hat{F} \equiv \frac{\dot{F}}{F}$ increases with the

stock of academic habits, $\frac{d\hat{F}}{dH} > 0$, if $0 < \xi < 1$.

Proof: $\frac{d\hat{F}}{dH} = \frac{1}{(1-\phi)} \left[-(\xi-1) \frac{\phi \rho b}{a} P^{1-\phi} F^{\phi-1} H^{\xi-2} \right] > 0 \Leftrightarrow 0 < \xi < 1$.¹⁰

3. The department problem

¹⁰ Notice how, in the case of admiration ($\xi < 0$), this result is magnified. In this case the agent's utility increases with a *ceteris paribus* increase in the habit stock, i.e. the agent feels better off if members of the community around him are successful. The magnification effect reflects the fact that the agent will try to imitate the people he admires, therefore increases in H will make the scholar's productivity rate of growth increase by more than in the case that preferences reflect jealousy.

The department problem is to set the tenure rules and standards, T , in order to maximize the department's preferences over time,

$$\underset{T}{Max} \int_0^{\infty} V(T) e^{-\pi t} dt$$

while taking into consideration the scholar's reaction function, described by equation (6), together with the scholar's constraint, given by equation (2).

Notice that $\pi > 0$ is the department's rate of time preference. In what follows we examine two cases of interest: 1) when the scholar is more impatient than the department, $r > \pi$; 2) when the department is more impatient than the scholar, $r < \pi$.

Assuming $V(T) = \ln T$, we have the following Hamiltonian function for the department problem:

$$K = \ln T + \mu \rho (F^\phi P^{1-\phi} + \Omega - T) + \delta \frac{F}{(1-\phi)} \left[r - \frac{\phi \rho b}{a} P^{1-\phi} F^{\phi-1} H^{\xi-1} \right] \quad (7)$$

The first order conditions for the department problem are:

$$K_T = 0 \Rightarrow \frac{1}{T} - \mu \rho = 0 \quad (8)$$

$$\dot{\mu} - \pi \mu = -K_H \Rightarrow \dot{\mu} - \pi \mu = \frac{\delta}{(1-\phi)} \left[\frac{\phi \rho b}{a} (\xi - 1) P^{1-\phi} F^\phi H^{\xi-2} \right] \quad (9)$$

$$\begin{aligned} \dot{\delta} - \pi \delta &= -K_F \Rightarrow \\ \dot{\delta} - \pi \delta &= - \left[\mu \rho \phi P^{1-\phi} F^{\phi-1} + \frac{\delta r}{(1-\phi)} - \frac{\delta}{(1-\phi)} \frac{\phi^2 \rho b}{a} P^{1-\phi} F^{\phi-1} H^{\xi-1} \right] \end{aligned} \quad (10)$$

Plus the transversality conditions: $\lim_{t \rightarrow \infty} e^{-\pi t} \mu H = \lim_{t \rightarrow \infty} e^{-\pi t} \delta F = 0$.

4. The steady state equilibrium

Imposing the stationary conditions, $\dot{H} = \dot{F} = \dot{\mu} = \dot{\delta} = 0$ in (2), (6), (9) and (10) and considering equation (8), we can determine the steady state values of H , F , T , μ and δ :

$$\dot{H} = 0 \Rightarrow T = F^\phi P^{1-\phi} + \Omega \quad (11)$$

$$\dot{F} = 0 \Rightarrow \left(\frac{P}{F}\right)^{1-\phi} H^{\xi-1} = \frac{ar}{\phi \rho b} \quad (12)$$

$$\dot{\mu} = 0 \Rightarrow \pi \mu = - \left[\frac{\delta}{(1-\phi)} \frac{\phi \rho b}{a} (\xi-1) P^{1-\phi} F^\phi H^{\xi-2} \right] \quad (13)$$

$$\dot{\delta} = 0 \Rightarrow \delta \pi = \left[\mu \rho \phi \left(\frac{P}{F}\right)^{1-\phi} + \frac{\delta r}{(1-\phi)} - \frac{\delta}{(1-\phi)} \frac{\phi^2 \rho b}{a} \left(\frac{P}{F}\right)^{1-\phi} H^{\xi-1} \right] \quad (14)$$

$$K_T = 0 \Rightarrow \frac{1}{T} - \mu \rho = 0 \quad (15)$$

The system of equations (11)-(15) determines simultaneously the steady state values of H , F , T , μ and δ . In order to disentangle this system to find explicit values for the endogenous variables, substitute eq. (14) into (13), which eliminates both co-state variables μ and δ , generating the following equation:

$$\frac{(\phi \rho)^2 b}{a} (\xi-1) \left(\frac{P}{F}\right)^{2(1-\phi)} F H^{\xi-2} = \pi \left[r - \pi(1-\phi) - \frac{\phi^2 \rho b}{a} \left(\frac{P}{F}\right)^{1-\phi} H^{\xi-1} \right] \quad (16)$$

Solving the system of equations (11), (12) and (16) for H , F , T , yields the following steady state values denoted by an asterisk and expressed as a function of F^* [see Appendix]:

$$F^* = \left[\frac{\pi(r-\pi)(1-\phi)}{(\xi-1)} \right]^{\frac{\xi-1}{\phi\xi-1}} \left(\frac{ar^{2-\xi}}{b(\phi\rho)^\xi} P^{\phi\xi-\xi} \right)^{1/(\phi\xi-1)} \quad (17)$$

$$T^* = P^{1-\phi} F^{*\phi} + \Omega \quad (18)$$

$$H^* = \left[\frac{r(\xi - 1)\phi\rho}{\pi(r - \pi)(1 - \phi)} \right] P^{1-\phi} F^{*\phi} \quad (19)$$

The non-negativity conditions for F^* , T^* and H^* are: 1) $0 < \xi < 1$, and $r < \pi$; 2) $\xi > 1$, and $r > \pi$.

The following propositions have trivial proofs. The second important result of this paper appears in the proposition 2 below:

Proposition 2: The steady state values of scholar's productivity and academic habits are positively related, $dF^*/dH^* > 0$.

Propositions 1 and 2, for the particular case 1) $0 < \xi < 1$, and $r < \pi$, highlight the main contribution of this paper regarding the relationship between academic habits and scholar's productivity. They show that academic habits have lasting positive effects on scholar's productivity, since it leads to a higher scholar's productivity rate of growth and scholar's productivity level.

Proposition 3 below describes the importance of tenure rules and standards:

Proposition 3: The optimal tenure rules and standards T^* have a positive impact in the scholar's productivity and academic habit formation: $dF^*/dT^* > 0$ and $dH^*/dT^* > 0$.

Proposition 3 shows that the department can create incentives, through objective tenure rules and standards that build academic habits with lasting effects on the scholar's academic productivity.

5. The comparative statics analysis

Besides the relationship among the endogenous variables as exposed in Propositions 2 and 3, the comparative statics analysis illuminates other properties of the model. The marginal impact of each parameter appears in the table below:

	a	b	r	ϕ	ρ	π	P
F^*	(-)	(+)	(-)	(+,-)	(+)	(+)	(+)
T^*	(-)	(+)	(-)	(+,-)	(+)	(+)	(+)
H^*	(-)	(+)	(+)	(+,-)	(+)	(-)	(+)

Notice that the higher the scholar's impatience (r) and preference for academic productivity (a), the lower the equilibrium level of scholar's productivity, F^* , and tenure rules and standards, T^* . In contrast, the higher the department's rate of time preference (π) and scholar's preference for academic habits (b), and lower the level of persistence in habits [higher ρ], the higher the scholar's productivity and tenure rules and standards. Concerning the optimal stock of academic habits, H^* , it increases with the scholar's impatience (r) and decreases with department's impatience (π).

The last column shows the impact of the exogenous variable P on the endogenous variables of the model. An increase in the exogenous productivity level of academic peers leads to an increase in the scholar's productivity and academic habits as well as to an increase in the tenure rules and standards. That is, when the average level of productivity of the academic community increases, this raises the standards for prospective scholars.

6. Concluding remarks

Why some academics continue to be productive after receiving tenure? If they are not supposed to lose their jobs if they become less productive, why do they bother in keeping up with other scholars and with the pace of evolution of knowledge? This paper answers this question by arguing that scholars who develop a stock of academic habits and achieve excellence are able to maintain their academic productivity at high levels even after receiving tenure. In a nutshell, the formation of academic habits has a lasting impact in a scholar's future productivity.

This paper shows that departments can use tenure rules and standards as an incentive system to make scholars develop working habits that ultimately leads to a successful and productive career as academics. In a Stackelberg differential game between departments and scholars, the department takes into account the effects of its choice of tenure rules and standards on the scholar's productivity and academic habit formation, while the scholar takes the department choice as given. In the optimal solution of the model it is shown that academic habits have a lasting positive impact in the scholar's productivity, leading to a higher scholar's productivity rate of growth and productivity level. Moreover, tenure rules and standards increase with the average level of productivity of the academic community.

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APPENDIX

In this appendix we show how to derive the steady state equilibrium, given by equations (17)-(19) in the paper. We begin by manipulating (12) in order to obtain $(P/F)^{1-\phi} = H^{1-\xi} (ar/\phi\rho b)$ and replacing this in (16), we get

$$\frac{(\phi\rho)^2 b}{a} (\xi-1) \left(H^{1-\xi} \frac{ar}{\phi\rho b} \right)^2 FH^{\xi-2} = \pi \left[r - \pi(1-\phi) - \frac{\phi^2 \rho b}{a} \left(H^{1-\xi} \frac{ar}{\phi\rho b} \right) H^{\xi-1} \right] \quad (\text{A.3})$$

which after some algebra can be expressed as,

$$\pi \left((1-\phi)(r-\pi) \right) = \frac{ar^2 (\xi-1)}{b} FH^{-\xi} \quad (\text{A.4})$$

Combining (11) with (12) we get the following relation

$$(T-\Omega) \frac{\phi\rho}{H} = H^{-\xi} F \frac{ar}{b} \quad (\text{A.5})$$

and replacing this in (A.4) yields,

$$H\pi \left((1-\phi)(r-\pi) \right) = r\phi\rho (\xi-1) (T-\Omega) \quad (\text{A.6})$$

To find the steady state we solve (11), (12) and (A.6) for H , T and F .

Solving (12) for H , and replacing this in (A.6) along with the condition $T = F^\phi P^{1-\phi} + \Omega$, yields,

$$\left[\left(\frac{F}{P} \right)^{1-\phi} \frac{ar}{\phi \rho b} \right]^{\frac{1}{1-\xi}} = \frac{F^\phi P^{1-\phi} r \phi \rho (1-\xi)}{\pi ((1-\phi)(r-\pi))} \quad (\text{A.7})$$

solving this for F we obtain equation (16), while equations (17) and (18) result from (11) and (A.6) respectively.